

User's Manual
(Edition 1.2, May 2005)
for
MiniARM-2104
Evaluation Board

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Table of Contents

1. INTRODUCTION.....6

2. GETTING STARTED 8

2.1 UNPACKING:..... 8

2.2 POWER SUPPLY REQUIREMENTS..... 8

2.3 CONNECTING THE SYSTEM:..... 9

3. HARDWARE DESCRIPTION 11

THE MINIARM-2104 SPECIFICATIONS: 11

4. CONNECTOR DETAILS AND JUMPER SETTINGS 14

DESCRIPTION OF ITEMS IN FIGURE 1: 17

P1 Connector: 18

JP2 Connector: 18

JP3 Connector: 19

JP4 Connector: 20

JUMPER SETTINGS DESCRIPTION:..... 22

5. RUNNING USER PROGRAMS ON MINIARM-210423

6. OPTIONAL ACCESSORIES OF MINIARM-2104.....25

LCD MODULE:..... 25

5X5 MATRIX KEYBOARD:..... 26

WOODEN ENCLOSURE:..... 26

7. MINIARM-2104 APPLICATIONS.....28

1. Introduction

This is user's manual for MiniARM-2104 Evaluation Board for LPC2104 micro-controller. This is a general-purpose board designed as a development tool; this board has a facility to download HEX file into the on-chip flash code memory of the micro-controller.

It is strongly recommended to read this manual carefully before you start using the MiniARM-2104 board.

CAUTION: This board contains components that are sensitive to EletroStatic Discharge (ESD). The board must be handled carefully, so as not to subject it to ESD. As far as possible, do not touch any conducting part on the board – including any component or connector pins – as this may damage

parts of the board permanently. If you must touch any of the parts, make sure to discharge yourself to earth. Parts damaged due to ESD are not covered by the limited warranty.

2. Getting Started

2.1 Unpacking:

You will find following items in the package:

- MiniARM-2104 board
- 2 Serial communication cables
- “Y splitter”
- Power adaptor* with cable
- SPJ Systems CD-ROM

*Power adaptor is included only if the board is shipped in India. If the board is shipped to any country other than India, only a power jack with a pair of red and black wires is supplied. The user is required to provide nominal +9VDC supply across the 2 wires: Red=positive, Black=negative. This supply voltage maybe in the range 8 to 11 VDC.

2.2 Power Supply Requirements:

The power adaptor works with 230Volts AC. It produces approximately 9 Volts DC, and the MiniARM-2104 uses an on-board regulator to

provide 5 Volts DC to all components on the board. Other on-board regulators provide 3.3V and 1.8V DC to LPC2104.

2.3 Connecting the system:

The “Y” splitter should be connected to 9 pin DSUB connector on the board. The other end of this “Y” splitter has 2 DB9 connectors, marked “0” and “1”. The 2 serial communication cables supplied with the board can be connected to these 2 connectors. Connector marked “0” is the default serial port of LPC2104 converted to 3 wire RS232 port. This is used for programming the LPC2104 micro-controller by connecting to PC and running

appropriate ISP software. Connector marked “1” is the second serial port of LPC2104 converted to 3 wire RS232 port. Insert the power adaptor output jack into the on-board power socket. Plug the power adaptor into 230VAC mains outlet. The system is now ready to be turned on.

3. Hardware Description

The MiniARM-2104 specifications:

The MiniARM-2104 includes:

- 1) The processor LPC2104 @ 12 or 14.7456 MHz.
- 2) LCD interface circuit with 16 pin connector for connecting text LCD module.
- 3) Keyboard interface circuit and 12 pin connector for connecting 5 X 5 matrix keyboard.
- 4) Two 3 wire RS232 Serial Ports in a single DB9 connector and 2 cables to connect to PC. A “Y splitter” is also supplied to split the on-board DB9 connector into 2 separate DB9 connectors for the 2 serial ports.
- 5) Regulators to supply 5V, 3.3V and 1.8V to the MiniARM-2104 board.

- 6) DC adaptor* (230 VAC input, 9 VDC output, 50 mA) which can be directly connected to the board. [* only included in India]
- 7) CD-ROM containing:
 - a) Evaluation version of SPJ Systems' SCARM – C Compiler for ARM.
 - b) Sample programs to access LCD, serial port RTC, etc.
 - c) LPC2000 ISP software, courtesy of Philips Semiconductors.
- 8) Unused / optionally used port pins are available on convenient connectors.
- 9) Push-button to reset (re-start) the micro-controller.
- 10) Toggle switch to change between RUN mode and ISP mode.
- 11) 64K I2C compatible EEPROM.
- 12) I2C compatible Real Time Clock (RTC) with battery.

Please note, the LCD or keyboard is NOT supplied with the MiniARM-2104. Those can be bought separately and connected to MiniARM-2104.

4. Connector Details and Jumper Settings

Figure 1 shows the locations of different components on the board. The MiniARM-2104 comprises of a baseboard and a daughter-board. The LPC2104 micro-controller is soldered on the daughter-board. The dashed polygon in Figure1 is approximate representation of the daughter-board. CAUTION: Please do not attempt to separate the daughter-board from baseboard. Doing so may cause permanent damage to the board. It will also make the warranty void.

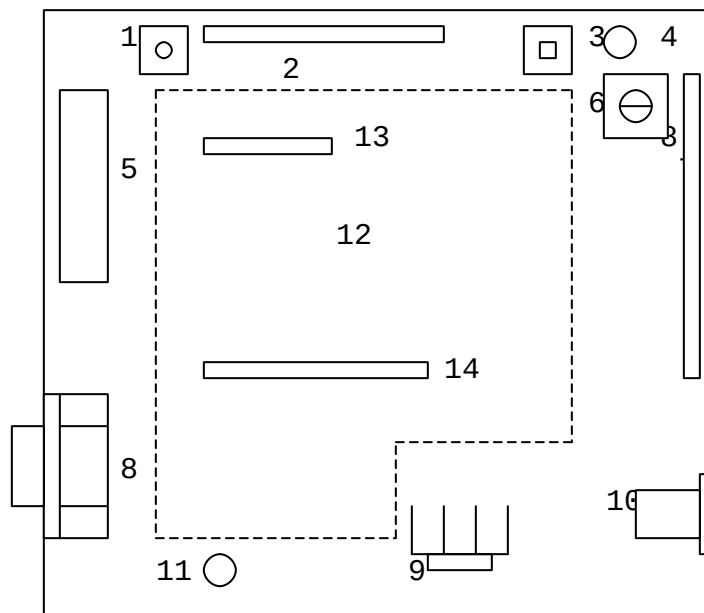


Figure 1: MiniARM-2104 – component locations

Description of items in Figure 1:

- 1 = Reset Push-button (S2)
- 2 = Keyboard(5X5 matrix) connector (JP2)
- 3 = Mode selection switch (Program / Run) (S1)
- 4 = program mode indicator LED (D2)
- 5 = Port pins connector (JP3)
- 6 = Variable resistor for Contrast Adjustment.
- 7 = Connector for LCD (JP4)
- 8 = Serial port connector (P1)
- 9 = Power regulator
- 10 = Power input socket (JP1)
- 11 = power-on indicator LED (D3)
- 12 = DaughterBoard to host LPC2104 μ C.
- 13 = J2 connector for SPI (on the daughter-board)
- 14 = J1 connector for JTAG (on the daughter-board)

Connector Details:

P1 Connector:

This is a DB9 female connector, used for RS232 serial communication with the PC:

Pin 2 = RS232 RxD0 (input to μ C)

Pin 3 = RS232 TxD0 (output of μ C)

Pin 5 = Ground

Pin 4 = RS232 RxD1 (input to μ C)

Pin 6 = RS232 TxD1 (output of μ C)

All other pins of P1 are unused.

JP2 Connector :

This connector is designed for connection to 5X5 matrix keyboard, however the same connector can be used for general purpose I/O or any other purpose. It essentially contains some port pins and Vcc and GND. Here is the pin description:

Pin 1 to 8 = P0.22 to P0.29

Pin 9 = P0.30

Pin 10 = P0.31

Pin 11 = GND

Pin 12 = Vcc

The 8 pins of port P0 are pulled-up with on-board resistors of value 10K.

JP3 Connector :

This is a dual line, 20 pins (10X2) connector.

The pin description is:

Pins 1,2 = Vcc

Pins 3,5,7,9,11,13 = P0.4 to P0.9

Pins 15,17= P0.2, P0.3

Pins 4,6 = P0.1,P0.0

Pins 8,10,12,14,16,18= P0.16 to P0.21

Pins 19,20 = GND

Referring to Figure1, the pin in left-top corner of JP3 is pin number 1 and right-top corner is pin number 2. Pins on the left are numbered 1,3,5...19

from top to bottom. Pins on the right are numbered 2,4,6...20 from top to bottom.

Port pins P0.2 and P0.3 are also used as SCL and SDA (respectively) for I2C bus. These pins are also available on JP3 connector, so user may add more I2C devices on the same bus externally.

JP4 Connector :

This is a 16 pin, single line connector, designed for connection to standard, text LCD modules. The pin/signal correspondence is designed to be matching with that required by such LCD modules.

Pin 1 = GND

Pin 2 = Vcc

Pin 3 = Vlcd

Pin 4 = P0.15 (Used as RS of LCD)

Pin 5 = GND

Pin 6 = P0.14 (Used as EN of LCD)

Pin 7 to 10 = No Connection

Pin 11 to 14 = P0.10 to P0.13 (Used as D4-D7 of LCD)

Pin 15 = Backlighting

Pin 16 = GND

J1 Connector:

J1 is 9pins (9X1) connector for JTAG.

The pin description is:

Pin 1 = VDD (3.3V)

Pin 2 = TRST of JTAG /P0.17

Pin 3 = TDI of JTAG/P0.20

Pin 4 = TMS of JTAG/P0.18

Pin 5 = TCK of JTAG/P0.19

Pin 6 = RTCK of JTAG

Pin 7 = TDO of JTAG/P0.21

Pin 8 = RST for JTAG

Pin 9 = GND

J2 Connector:

Pin 1 = GND

Pin 2 = SS / P0.7

Pin 3 = MISO / P0.5

Pin 4 = MOSI/ P0.6

Pin 5 = SCK/ P0.4

Pin 6 = Vcc

Jumper Settings Description:

The JP5 jumper on the MiniARM-2104 board can be used to control LCD backlighting.

JP5 open -> backlighting off.

JP5 short -> backlighting on.

5. Running user programs on MiniARM-2104

The MiniARM-2104 includes LPC2104 micro-controller. It has 128KBytes of on-chip flash program memory. Further, this program memory is In System Programmable (ISP). The ISP software (courtesy of Philips Semiconductors) is included on the accompanying CD. It allows the user to “download” a program (Intel HEX file) directly into the processor.

Follow these simple steps to download your program into the μ C and run it:

1. Turn off power to the MiniARM-2104.
2. Press the “Mode selection switch” (SW1). It should stay in the pressed down position.

3. Connect the MiniARM-2104 to the serial port of PC (COM1 or COM2 etc.). Use the serial communication cable that was supplied with the board.
4. On the PC, run the LPC200 ISP software. This software is included on the CD that is supplied with MiniARM-2104. Follow the instructions given in this ISP software to erase / program the on-chip flash of LPC2104. When the software prompts you to reset the processor, you may momentarily press the RESET switch on the board.
5. Turn off power to the MiniARM-2104.
6. Press the mode selection switch (SW1) once again. Now it should stay in the “up” position.
7. Turn on power to the MiniARM-2104 and your program should run.

6. Optional Accessories of MiniARM-2104

This chapter describes optional accessories of the MiniARM-2104 evaluation board:

LCD module:

Number of different types of LCD modules can be connected to MiniARM-2104. For example: 16 char X 1 row, 16 char X 2 rows, 16 char X 4 rows and so on. Most LCD modules use the same pin connections as connector JP4 of MiniARM-2104. Hence, a simple one-to-one cable maybe used to connect such an LCD module to MiniARM-2104. In case you plan to use an LCD module which has different pin connections than JP4, then you must

not use one-to-one cable. If you buy LCD module from SPJ, it includes a cable which can be directly connected to JP4 of MiniARM-2104.

5X5 Matrix Keyboard:

This is a simple matrix keyboard with 25 keys, organized as 5X5. The JP2 connector of MiniARM-2104 is designed to connect to such a keyboard. The JP2 connector also include Vcc and GND pins, which are not required by the keyboard. Hence, only first 10 pins of JP2 maybe directly connected to 5X5 matrix keyboard. If you buy 5X5 matrix keyboard from SPJ, it includes a cable which can be directly connected to JP2 of MiniARM-2104.

Wooden Enclosure:

This is a simple wooden box, very convenient for mounting the MiniARM-2104 and accessories. If you buy MiniARM-2104 with this wooden box, the

MiniARM-2104 board is fitted with screws inside the box. In order to use the board, the box must be kept open and then you may connect serial cable and power jack. This enclosure also has sufficient space for accommodating the 5X5 matrix keyboard and upto 16X2 LCD module. If you buy MiniARM-2104 + LCD + 5X5 Matrix Keyboard + Wooden Enclosure from SPJ, then all the above will be fitted inside the Enclosure; only serial cable, power adaptor and software CD will be outside it.

7. MiniARM-2104 Applications

The MiniARM-2104 evaluation board is designed for using in many different configurations. Some of them are described here:

1. As a test platform for LPC2104 based applications. Using the default configuration, you can download your program (HEX file) into the on-chip Program memory of the processor and run it.
2. You can test your program at "real-time" at a fraction of a cost of an In Circuit Emulator.
3. The sample programs provided with the MiniARM-2104 evaluation board include programs to interface with LCD and matrix keyboard etc. Thus, you can connect the required peripherals externally and have your application ready in a short time.

4. To quickly implement “prototype” of any product.
- 5 . As an experimenting platform for self-learning or for training.